

ABSTRACT

An apparatus and method for performing nucleic acid (DNA and/or RNA) sequencing on a single molecule. The genetic sequence information is obtained by probing through a DNA or RNA molecule base by base at nanometer scale as though looking through a strip of movie film. This DNA sequencing nanotechnology has the theoretical capability of performing DNA sequencing at a maximal rate of about 1,000,000 bases per second. This enhanced performance is made possible by a series of innovations including: novel applications of a fine-tuned nanometer gap for passage of a single DNA or RNA molecule; thin layer microfluidics for sample loading and delivery; and programmable electric fields for precise control of DNA or RNA movement. Detection methods include nanoelectrode-gated tunneling current measurements, dielectric molecular characterization, and atomic force microscopy/electrostatic force microscopy (AFM/EFM) probing for nanoscale reading of the nucleic acid sequences.
